

PATENT

Atty. Dkt. No. SAR 14778

REMARKS

This is intended as a full and complete response to the Office Action dated March 23, 2005 having a shortened statutory period for response set to expire on June 23, 2005. Please reconsider the claims pending in the application for reasons discussed below.

I. Rejection of Claim 10 under 35 U.S.C. § 112

Claim 10 stands rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicants regards as the invention. Specifically, the Examiner asserts that the terms "microfluidic" and "nanofluidic" are "relative terms which render the claim indefinite[,] . . . are not defined by the claim, [and] the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention." Applicants traverse this rejection.

Applicants have amended claim 10 by removing the term "nanofluidic." Thus, claim 10 now requires "at least one channel is microfluidic", which renders the claim definite. In this regard, the terms "microfluidic" and "nanofluidic" have a specific ordinary or denotative meaning. For example, "microfluidics" is defined as:

Microfluidics is the science of designing, manufacturing, and formulating devices and processes that deal with volumes of fluid on the order of nanoliters (symbolized nl and representing units of 10^{-9} liter) or picoliters (symbolized pl and representing units of 10^{-12} liter). The devices themselves have dimensions ranging from millimeters (mm) down to micrometers (μm), where $1 \mu\text{m} = 0.001 \text{ mm}$.

See http://whatis.techtarget.com/definition/0,sid9_gci526632,00.html.

Similarly, for example, "nanofluidic" is defined as:

Nanofluidic phenomena are characterized by length scales ranging roughly between 1 nm and 100 nm.

See <http://www.kirbyresearch.com/index.cfm/page/ri/nfluids.htm>

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Therefore, for example, the term "microfluidic" describes devices having portions that communicate with volumes of fluid on the order of nanoliters or picoliters.

Furthermore, one of ordinary skill in the art would be apprised of the scope of the invention when taken in context with the discussion of the term "microfluidic" or "nanofluidic" as an adjective describing the type of channel, e.g., one that can manage nanoliters or picoliters of liquid in the specification. For example, as shown in Figures 1 and 5, and the relevant discussion relating thereto, there is provided a "microfluidic, or nanofluidic channel 140 within which a small volume of liquid is contained for transporting the aerosol or other particles that have been focused therein." (See Applicants' Specification, Paragraph 0027). Likewise, "[t]he particles are drawn through the capillaries in the mesh 134 and into the liquid of the capture section 108, where a continuous liquid flow through the microfluidic channels 140 transports the captured particles into the collection chamber 142." (See Applicants' Specification, Paragraph 0035).

Therefore, taking the ordinary denotative definition of "microfluidic" or "nanofluidic" in combination with discussion in the specification, it is clear that use of the terms "microfluidic" and "nanofluidic" in claim 10 to describe the type or size of the channel 140 is definite and provides one of ordinary skill in the art to be apprised of the scope of the invention. Thus, claim 10 is not indefinite. Withdrawal of the rejection is respectfully requested.

II. REJECTION OF CLAIMS 1, 9-12, 24, 27 AND 31 UNDER 35 USC § 103

A. Claims 1, 9-12, 24 and 27

Claims 1, 9-12, 24 and 27 stand rejected under 35 USC § 103(a) as being unpatentable over Irving, et al. (U.S. Patent No. 6,468,330, issued October 22, 2002, herein referred to as "Irving") in view of Bradley (U.S. Patent No. 6,550,347, issued April 22, 2003). Applicants respectfully disagree.

Irving teaches a mini-cyclone biocollector and concentrator. Bradley teaches a vacuum air sampler.

The Examiner's attention is directed to the fact that Irving and Bradley (either singly or in any permissible combination) fails to teach or suggest the novel concept of

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an apparatus for collecting airborne particles having a hydrophobic membrane disposed between a separation section and a capture section for establishing a controllable boundary, as positively claimed by the Applicants. Specifically, Applicants' independent claims 1 and 24 positively recite:

1. An apparatus for collecting airborne particles comprising:
 - an air intake assembly for drawing an air sample into the apparatus;
 - a separation section coupled to the air intake assembly for separating particles from the air sample;
 - a capture section coupled to the separation section for transporting the particles in a liquid; and
 - a hydrophobic membrane disposed between the separation section and the capture section for establishing a controllable boundary therebetween. (Emphasis added.)
24. A system for analyzing airborne particles comprising:
 - a particle collection apparatus adapted to collect airborne particles comprising:
 - an air intake assembly for drawing an air sample into the apparatus;
 - a separation section coupled to the intake assembly for separating particles from the air sample;
 - a capture section coupled to the separation section for transporting the particles in a liquid; and
 - a hydrophobic membrane disposed between the separation section and the capture section for establishing a controllable air/fluid boundary therebetween; and
 - a particle analysis device coupled to the collection apparatus for receiving a liquid sample from the capture section. (Emphasis added.)

Specifically, embodiments of Applicants' invention generally provide an apparatus for collecting particles (for example, biological aerosol particles) from an air sample comprising an air intake assembly adapted to draw the air sample into the apparatus, a separation section coupled to the intake assembly and adapted to separate aerosol particles from the air sample, a capture section coupled to the separation section and adapted to transport the aerosol particles into a stream of liquid, and a hydrophobic membrane disposed between the separation section and the capture section and adapted to establish a controllable air/fluid boundary therebetween. Namely, embodiments of Applicants' invention generally provide a compact, lightweight,

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low power and low noise device capable of collecting respirable airborne particles and focusing them into a small liquid volume.

In contrast, the Examiner acknowledged and conceded that the Irving failed to teach the use of a hydrophobic membrane. The Examiner attempted to bridge this significant gap by citing Bradley for this teaching. The Applicants respectfully disagree. It should be noted that Bradley's use of the hydrophobic filter is to prevent aqueous liquids from exiting the sampler body. Bradley teaches that:

"Air to be sampled is bubbled through the entrapment fluid, which traps and retains a selected air component for later testing. Air which is thus bubbled through the entrapment fluid passes through a hydrophobic filter before leaving the sampler body." (See Bradley, Abstract)

Thus, it is clear that Bradley's hydrophobic filter is not disposed between a separation section and the capture section. Applicants' separation section is coupled to the intake assembly for separating particles from the air sample. Bradley's filter is deployed to simply keep the liquid in the sampler body. There is absolutely no separation section. Thus, combining Irving with Bradley simply fails to make Applicants' invention obvious as claimed in Applicants' independent claims 1 and 24.

Applicants' dependent claims 9-12, and 27 depend from claims 1, and 24 respectively, and recite additional limitation. At least for the reason stated above, claims 9-12, and 27 are also not made obvious by the teaching of Irving and Bradley. The Applicants respectfully request the rejection be withdrawn.

Claim 31

Claims 31 stands rejected under 35 USC § 103(a) as being obvious over Bradley et al (U.S. Patent Application Publication 2004/0107782) (Bradley) in view of Jeon et al. (U.S. Patent No. 6,082,179) (Jeon). Applicants respectfully disagree.

Applicants submit that the teaching of Jeon also fails to teach the use of a hydrophobic membrane as claim in Applicants' claim 31. Thus the combination of Jeon with Bradley also fails to make Applicants' invention obvious as claimed in claim 31. The Applicants respectfully request the rejection be withdrawn.

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III. Allowable Subject Matter

The Examiner has objected to claims 13-17 as being dependent upon a rejected base claim. The Examiner concludes that these claims would be allowable subject matter if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The Applicants thank the Examiner for indicating the allowable subject matter with respect to these claims. However, in view of the arguments set forth above, the Applicants believe the base claims (and all intervening claims) are in allowable form and, as such, the dependent claims 13-17, as they stand, are therefore in allowable condition. Therefore, the Applicants respectfully request that the foregoing objections to claims 13-17 be withdrawn.

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Conclusion


Thus, the Applicants submit that all of these claims now fully satisfy the requirements of 35 U.S.C. §103. Consequently, the Applicants believe that all these claims are presently in condition for allowance. Accordingly, both reconsideration of this application and its swift passage to issue are earnestly solicited.

If, however, the Examiner believes that there are any unresolved issues requiring the issuance of a final action in any of the claims now pending in the application, it is requested that the Examiner telephone Mr. Kin-Wah Tong at (732) 530-9404 so that appropriate arrangements can be made for resolving such issues as expeditiously as possible.

Respectfully submitted,

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Date


Kin-Wah Tong, Attorney
Reg. No. 39,400
(732) 530-9404
Moser, Patterson & Sheridan, LLP
595 Shrewsbury Avenue
Shrewsbury, New Jersey 07702